WAWONA COVERED BRIDGE
Yosemite National Park Roads and Bridges
Spanning South Fork Merced River on service road
Wawona
Mariposa County
California

HAER NO. CA-106

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

HISTORIC AMERICAN ENGINEERING RECORD
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HISTORIC AMERICAN ENGINEERING RECORD

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Yosemite National Park
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I. INTRODUCTION

Location:	This bridge carries a service road across the South Fork of the Merced River at the Pioneer Yosemite History Center at Wawona, Yosemite National Park, Mariposa County, California. QUADS: BASS LAKE, CA WAWONA, CA UTM: 11/265450/4157750
Date of Construction:	1868; converted to covered bridge ca. 1875; rebuilt in 1956.
Designer and Builder:	Original open-deck bridge built by Galen Clark. Ca. 1875-78 remodeling by Henry Washburn and partners.
Original and Present Owner:	Original: Galen Clark Present: National Park Service, Yosemite National Park
Structure Type:	Modified Queen-post truss bridge
FHwA Structure No.:	8800-015T
Present Use:	Service road bridge, limited access.
Significance:	The Wawona Covered Bridge is the oldest bridge in Yosemite National Park and a rare example of a covered bridge in a national park. It is significant as a rare reminder of pioneer forms of bridge construction.
Project Information:	This document was prepared as part of the Yosemite Roads and Bridges Recording Project, conducted in summer 1991 by the Historic American Engineering Record. Richard H. Quin

II. HISTORY

This is one in a series of reports prepared for the Yosemite National Park Roads and Bridges Recording Project. HAER No. CA-117, YOSEMITE NATIONAL PARK ROADS AND 8RIDGES, contains an overview history of the park roads.

HISTORY OF THE WAWONA COVERED 8RIDGE

The Wawona Covered Bridge, spanning the South Fork of the Merced River, is one of the oldest covered bridges in California, and the only covered bridge in the western region of the National Park System.[1] The bridge was built by Galen Clark in 1868, and was converted to a covered bridge about ten years later. It is the oldest surviving bridge in Yosemite National Park.

The South Fork of the Merced was first crossed by the Mann Brothers' Trail (or Mariposa Trail), a toll route wide enough for the passage of pack horses, about 1855. The first crossing was a large log about 6' in diameter. The Manns replaced it with a crude bridge they called "Clark's Crossing" after Galen Clark, who had settled nearby in 1855. This bridge was rsportedly often rebuilt due to flooding on the river. Following an 1862 flood that destroyed the bridge, some trees were felled across the river as a replacement.[2]

Clark settled on the South Fork of the Merced River in the present Wawona area soon after his first visit to the Yosemite country in 1855. Wanting to attract visitors to a rustic hostel he established on the South Fork, he soon commenced road building operations from his location toward Yosemite Valley. [For more detailed accounts of Clark's road efforts, see Chapter II of the Yosemite Roads and Bridges Overview, HAER No. CA-117, and the report on the Wawona Road, HAER No. CA-117c.]

Although numerous park publications and the interpretive display at the Pioneer Yosemite History Center state that Clark built the bridge in 1857 or 1858, the structure was apparently not built until the late spring of 1868. In May of that year, Clark received permission from the Mariposa County 8oard of Supervisors to erect a bridge across the South Fork. On 1 June, the Supervisors gave permission for Clark to collect tolls:

> It is ordered by the Board that Galen Clark be permitted to collect toll on the completion of the Bridge across the South Fork of the Merced River on the Yosemite Trail for the term of one year at the following rates,
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> | | |
> |---|---|
> | Saddle horses and mules . . . . . | $1.00 |
> | Pack animals, loaded . . . . . | 1.00 |
> | Loose horses or mules . . . . . | 25¢ |
> | Shsep or swine . . . . . | 2¢ |
> | Loose cattle . . . . . | 10¢[3] |

On 31 July, the *Mariposa Gazette* reported that the bridge was nearly finished:

> We learn from Mr. Galen Clark, that by tomorrow he will have his bridge completed across the South Fork of the Merced River, on the trail between this place and the Yo Semite Valley. He will then as speedily as possible thoroughly repair the trail between the Mariposa Grove of 8ig Trees and Yo Semite Valley. Nearly one hundred dollars was raised in this place last week to assist in this public enterprise. Parties visiting the Mariposa Big Tree

> Grove and Yo Semite Valley by this route, will find the trail in as good and safe a condition for travel in ten days from now as ever heretofore.[4]

Later that month, a correspondent to the same paper wrote of crossing "the skeleton of a new bridge, on a plank" at Clark's, while her horses were swum across the river.[5]

Clark was still collecting tolls on the bridge in 1873, when the Supervisors warned him that he had received permission to collect tolls only for one year, and ordered him to desist.[6]

The costs of the road-building venture were instrumental in forcing Clark to sell his holdings. In late 1874, his holdings at the South Fork (along with those of his son, Alonzo, and their partners, Edwin Moore and Henry S. Rockwell) were acquired by Albert Henry Washburn and two partners.[7]

The Washburn group covered the bridge about 1878, giving it its basic present appearance. The wood was cut at the Washburn's nearby sawmill. A sash saw was used to cut the lumber into 12" cants, and a circular saw cut these cants into boards.[8] The Washburns may have roofed over the bridge to protect the wooden trusses, due to the heavy snowfall to which the Wawona area is prone; however, a display at the bridge suggests that they may have covered it in order to recreate a common form from their native New England.[9] Possibly, it was a combination of the two reasons.

The bridge has been altered or reconstructed on several occasions. As noted, the bridge began as an open-deck pony truss but was changed to a covered bridge about 1878. The Washburns also replaced the old wooden abutments with a new set at an undetermined date. In 1900, the approaches were lengthened by the inclusion of short 10' approach spans at either end. After automobiles were introduced in the park, the Washburns installed runner boards for the car wheels. In 1935, the park engineer reported that one of the bottom tranverse struts was cracked, and that one of the stringers was broken; a 1½-ton load limit was placed on the structure.[10] More repairs were done in 1937 by the Civilian Conservation Corps; as part of this project, additional stone was added to the timber crib foundations.[11] The new Wawona Road was placed in service at this time, and the principal traffic loads were diverted away from the covered bridge to a new bridge over the South Fork [HAER No. CA-113].

Severe floods in the winter of 1955 "mortally wounded" the covered bridge. An inspection by F. P. Cordero, field engineer for the California Department of Highways, noted that the bridge was sagging by 3'-4', that two of the floorbeams had been broken by drifts, and that most panel points were distorted. The floorboards were decaying, and the inner chords were failing due to rot. Cordero warned that the bridge was in danger of collapsing from its own weight.[12]

Park superintendent John Preston warned Lawrence C. Merriam, Director of the National Park Service's Region IV (and a former Yosemite superintendent), that the bridge was in imminent danger: "The situation is so critical at present that several inches of new snow upon the bridge could cause it to collapse. . . .We fear that if immediate aid is not forthcoming, the only covered bridge in the National Park System will be lost forever."[13]

At this point, the National Park Service considered replacing the bridge with an all-concrete bridge, a steel beam bridge with a concrete deck, or a wooden beam bridge with a laminated wooden deck.[14] But due to the bridge's historical significance, ccnsiderable debate ensued as to whether or not the historic

structure should be replaced or rebuilt. Park Service Director Conrad L. Wirth initially felt the bridge would have to be replaced, and directed the NPS Western Office to have the Historic American Buildings Survey prepare a set of measured drawings to record the bridge prior to its demolition.[15]

Superintendent Preston was a strong advocate for the bridge's preservation, or if that proved impracticable, for its reconstruction in kind.[16] He was supported by landscape architect Thomas C. Vint, the Park Service's Chief of Design and Construction, who stated "The bridge at Wawona is the only covered bridge under the jurisdiction of the Service and for that reason, if for none other, we are interested in its preservation."[17] After considerable discussion between different park agencies, a decision was reached to reconstruct the covered bridge as part of the National Park Service's ten-year "Mission 66" development program.

To protect it against collapse, a temporary pier was placed beneath the bridge, and on 26 November 1956, the structure was pulled to the north bank of the river for repairs. At this point, the bridge was measured and then dismantled. Rotted materials were discarded. To remove the roof shingles, fourteen bundles of 20 percent dynamite were exploded beneath the rafters to loosen the roofing nails.

The earlier stone-filled log cribs were replaced with new abutments of reinforced concrete faced with rock rubble masonry. New upper and lower chords were hand-hewn from ponderosa pine, and other boards and beams were cut or hewn from Douglass fir. All materials matched the ones originally used, even the square nails. Many of the original members were reused. The reconstruction was strong enough that some materials might have been omitted, but all were included for the sake of historical authenticity.[18] The work was done by contractor Glen M. Gordo of Catheys Valley, California under the supervision of National Park Service Assistant Engineer Norris Udell and Yosemite National Park Resident Engineer Luther Peterson.[19]

The trusses were reassembled on wooden rollers atop steel I-beams which served as tracks. When all work was completed except for the exterior siding, floorboards and roof shingles, the bridge was pulled back across the river, and the I-beams were removed. The final work was done with the bridge in place.[20] Some of the materials used were salvaged from other park structures. Superintendent Preston found some handmade shakes for the roof in the park, and the replacement boards for the exterior came from Civilian Conservation Corps structures being dismantled at nearby Camp Hoyle.[21]

The bridge reconstruction project heightened the interest of park officials in other historic structures in the park, and a decision was made to establish a reconstructed pioneer "village." The Pioneer Yosemite History Center, another Mission 66 project, was created around the covered bridge, with several historic buildings from around the park relocated to the site.[22]

Several more timbers were replaced in 1961.[23] In the early 1970s, the bridge needed further work. A draft environmental statement in June 1972 stated that one of the main timbers required replacement; the report warned that the bridge might collapse if the timber failed. In 1974, two of the tranverse stringers were replaced and the floor reconstructed above them. A wooden temporary pier was constructed to support the bridge, and a coffer dam utilized to divert the water away while the work was completed. Total cost of the project was $6,553.11.[24]

By 1977, further deficiences had manifested themselves. A bridge safety inspection conducted by the Federal Highway Administration (FHwA) in October

reported rotted floor beams and loosened panel points. The report recommended the replacement of five floor beams and the use of wooden shims or wedges to tighten connections. It also identified severe seasoning checks or splits in the ponderosa pine main truss members. Although their replacement was not yet mandatory, the report suggested that they should be, as if any of the compression members split full-length, the truss would not be capable of supporting even the bridge's dead weight.[25]

In 1983, the Federal Highway Administration provided drawings and specifications for major repair and reconstruction work for the covered bridge. These plans called for replacement of the heavy ponderosa pine truss frame, floorboards and several stringers. This work was carried out,[26] but the the main members are now suffering from checking and lateral splitting, and pose a future problem.

The bridge is listed in the National Register of Historic Places for its regional significance in engineering as one of the best-preserved covered bridges in California. The Wawona Covered Bridge remains in use as a gateway to the Pioneer Yosemite History Center, accomodating stock, stage, and foot traffic.

Description

The oldest part of the bridge, which bears the main load, is a modified Queen-Post truss with its main diagonal and upright members of hand-hewn ponderosa pine construction, reinforced with steel tie rods. These rods vary in diameter from 1¼" to 1¾", and are anchored into 1" bearing plates by heavy hex nuts. Other timber used in the bridge's construction is rough-sawn Douglas fir. The main timbers are 13"x14" in dimension; stringers are 14"x16" and the tranverse floor beams measure 14"x14". The housing covering the bridge is 132' 6" long, and 26' 4" to the center of the roof. Openings at either end are 13' 5" high and 14' 4" wide. The roof is covered by replacement wooden shakes, and a sprinkler system for fire control is housed in the rafters.

The single-span truss bridge is 106' long (measured from center of support to center of support), with a 13' 6" approach span at the north end and a 13' span at the south. The bridge deck is 16' 4" wide, but the clear roadway width is only 10' 3", with a pedestrian footpath of 3' 2" along the west side, separated by a 7" felloe guard. The deck is of 4"x6" timbers nailed to the stringers and the bottom chord with 8" spikes. Total width of the bridge, including the tranverse deck beams upon which the bottom chords rest, is 30' 2". As in a Howe truss, the main wooden truss is reinforced by vertical steel rods bolted to the top chords, and to the base of the bottom chord. The original iron or steel rods, being of an unknown grade of metal, were replaced after 1983 with graded steel members.

Some studies and the National Register of Historic Places nomination form for the bridge describe it as being built on the Howe truss plan, but the bridge actually is a wooden truss on a simpler Queen-Post plan, reinforced by vertical steel rods bored through the upper and lower chords. [The use of metal reinforcing stays is borrowed from Howe's design.] The wooden sides and the gabled wood shake roof are borne by a lighter braced frame buttressed by fourteen 4"x6" wooden knee braces from the deck beams. The main truss is constructed of ponderosa pine, but all the other timber is Douglas fir.

The bridge appears in generally fair conditions, but is sagging considerably. Due to sag and warp in truss members, field measurements for like members varied. The field notes from the survey record actual measurements, and the HAER drawings reflect present (1991) conditions.

ENDNOTES

1. National Register of Historic Places nomination form for Wawona Covered Bridge, prepared by Leslie Starr Hart and Merrill Ann Wilson, August 1976. Frequent accounts, including the nomination, erroneously state that it is the only covered bridge in the entire NPS system, but one exists in the Cuyahoga National Recreation Area, Ohio, and possibly in other units. The bridge may be the only one in an actual National Park.

2. Shirley Sargent, *Galen Clark: Yosemite Guardian*. (San Francisco: Sierra Club, 1964), 57, 64.

3. Mariposa County Board of Supervisors minutes, 1 June 1868. Supervisors' Book B, 369.

4. *Mariposa Gazette*, 3 July 1868, 2.

5. "Trip to the Yo Semite Valley," *Mariposa Gazette*, 31 July 1868, 1.

6. Mariposa County Board of Supervisors minutes, 7 July 1873. Supervisors' Book B, 655.

7. Rempel, 31.

8. *Ibid*..

9. Display at Pioneer Yosemite History Center.

10. C. A. Washburn to John C. Preston, Superintendent, 12 December 1954, Yosemite Research Library; Memorandum, Park Engineer to Charles G. Thomson, Superintendent, 24 March 1936. Copies in bridge correspondence file, Yosemite Park Maintenance and Engineering Office.

11. Bridge Inspection Report, 1.

12. Jack Fry, "Saving the Wawona Covered Bridge." *Yosemite Nature Notes*, Vol. XXXVI No. 11, Nov. 1957, 114, 11B.

13. John C. Preston, Superintendent, to Lawrence C. Merriam, NPS Region IV Director, 25 April 1956. Yosemite Research Library. There is at least one other covered bridge in the present national park system, at the Cuyahoga National Recreation Area in Ohio.

14. "Tentative Design for a Laminated Wooden Deck-Beam Bridge to Replace the Existing Covered Bridge at Wawona, Yosemite National Park, Submitted September 26, 1956 by Norris Udell, Assistant Park Engineer." Also designs for a steel-beam span bridge with concrete deck, and an all-concrete bridge.

15. Sanford Hill, Chief, NPS Western Office to John C. Preston, Superintendent, September 1956. Yosemite Research Library. HABS did not record the structure.

16. John Preston C. Preston, Superintendent, to R. F. Lee, NPS Chief of Interpretation, 29 August 1956. Yosemite Research Library.

17. Thomas C. Vint to Chief of Interpretation, NPS Region IV, n.d. Yosemite Research Library.

18. Fry, 118-120.

19. Douglass H. Hubbard, Press release on reconstruction of Wawona Covered Bridge, 3 December 1956. Yosemite Research Library collection.

20. *Ibid.*, 119-120.

21. John C. Preston, Superintendent, to Conrad Wirth, NPS Director, 25 June 1957. Yosemite Research Library.

22. Fry, 116; Interpretive display at Pioneer Yosemite History Center.

23. Greene, I:41*n*.

24. Draft Environmental Statement, "Proposed Maintenance of Covered Bridge at Pioneer Yosemite History Center," 20 June 1972, 1, Yosemite Research Library; Project Completion Report, Wawona-Pioneer Yosemite History Center, Repair of Covered Bridge, 1974. Yosemite National Park Maintenance and Engineering Office. Footings for the temporary pier are still visible beneath the bridge.

25. Lonnie E. Moss, Bridge Safety Inspection Report, South Fork Merced River Bridge (Wawona Service Road), Yosemite National Park. (Denver, CO: Federal Highway Administration, Office of Western Bridge Design, 16 October 1977), 1.

26. Greene, I:41*n*.

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